VOL. 5 NO. 4

AMERICAN JOURNAL OF OPTOMETRY

HYPEROPIA

Being the First Thesis of the B. Woodard Hazell Award of the Baltimore Optometric Club.

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Foreword. This subject is of peculiar interest to the non-medical refractionist as he is prevented by law in many places from the use of any drug to aid him in determining his diagnosis. One class of refractionists claim with certainty that hyperopia cannot be determined and prescribed for in the young and comparatively young without the use of a cycloplegic to put the accommodation at rest. Another class, far in the majority, take the opposite stand. Hyperopia alone of all the refractive errors is difficult to positively diagnose and even more difficult to correct with comfort and satisfaction to the patient. The average layman dreads and fears the use of "drops" and will do anything to avoid submitting to the ordeal. Loss of time, discomfort and cost all tend to make him avoid the operator who uses them and for relief he turns to the optometrist. It is obvious, therefore, that if hyperopia cannot be determined with sufficient accuracy without a cycloplegic then the fifteen or twenty thousand optometrists throughout the country alone are practicing under false pretenses. This I do not believe to be true and during twenty years' practice I have constantly been on the lookout for anything that has a bearing on the subject and I hope in this thesis to so present the most important facts in such order and so plainly that there will be no doubt left to disturb us and that our practice will be made more satisfactory and in turn our usefulness to our patients greatly increased—to give you something entirely new is impossible. I have seen nothing new since

Donders' time. It may be possible, however, to place the subject in a new light and if I succeed I will consider myself fortunate and you still more fortunate.

History. Previous to Donders there was but a vague and indefinite knowledge of this refractive error. It was referred to indirectly by previous writers but until Donders, with his wonderful talent in analyzing not only this but any subject he was interested in, started his researches, no clear, scientific study had been made; in fact, the credit for the discovery of hyperopia as such may fairly be given to this the greatest of all refractionists. It was in 1848 that he published the results of his investigations of this refractive error.

Definition. "Hyperopia may be defined as that condition of the eye in which there is a shortening of the antero-posterior diameter of the ball. This is commonly called the 'short eye,' or the refracting power of the eye may be deficient with the result that the focus is behind the retina."—*Brown.*

Varieties. According to Donders hyperopia is divided into three classes: Facultative, when it can be overcome by the accommodation without squinting; Relative, when it can be overcome by the accommodation when the subject squints; and Absolute, when it cannot be overcome by any effort of the accommodation. The latter is the hyperopia of old age. Facultative and relative hyperopia are always accompanied by latent and the sum of the manifest and latent is the hyperopia totalis.

Etiology. Hyperopia may be due to the shortening of the antero-posterior diameter of ball known as axial hyperopia, or to a diminished refractive power of the dioptric system which produces the same effect, or the absence of the crystalline lens either naturally or due to surgical interference. The latter is termed aphakia. Axial hyperopia is the most common of these forms.

Symptoms. In hyperopia, especially of the young, the patient usually sees well at a distance but complains that he has difficulty in maintaining clear vision for near objects; he must stop and rest his eyes at frequent intervals and if he persists becomes drowsy. In hyperopia of high degree he holds objects close to the eye to increase the visual angle. Parents will sometimes tell you the child is near-sighted—he holds his book close to his eyes when he reads.

In reading distance type the patient often begins to read slowly but he gradually, as he controls his accommodation, reads down to 20/20 line.

Redness and weak appearance of the eyes is often noticed and the edges of the lids sometimes become inflamed and thickened. Headache—supra-orbital—is a usual complaint. Those engaged in close work will say they start out fresh in the morning, but after a few

hours' work the eyes tire and by evening they are physically exhausted.

Blinking rapidly is a marked symptom in the higher degrees when distant vision is still good. This is done for the momentary rest afforded the accommodation. The eyes look and are actually smaller than the normal eye.

The strain imposed upon the nervous system from constantly employing the accommodation for distant vision results in many serious symptoms. Chorea and epilepsy, nervous prostration and even insanity are said to be closely identified with eye strain. The duration of life is even said to be shortened by constantly overtaxing of the ciliary muscles in hyperopia. Ball in his work on Ophthalmology gives an interesting chapter on diseases closely related to refractive errors.

Determination of Hyperopia. I do not intend to go fully into all the methods used in diagnosing this condition. The use of the retinoscope and ophthalmoscope are both so well known that they need only to be mentioned here. Skill in their use can be developed by constant practice only and as the findings are purely objective, the results must be confirmed by other tests. These two instruments will not measure latent hyperopia. The detection of manifest hyperopia is so simple it need not be taken into consideration. It is the measurement of the total hyperopia which is claimed to be impossible by any means other than a cycloplegic which is of the greatest importance not only to the optometrist but far more so to the patient. The mechanism of the accommodation is always involved in hyperopia and modifies all known methods of determining it.

Three Methods of Determining Hyperopia. "Hyperopia always exists: 1. When distant vision is not reduced by a convex lens. 2. When the patient can read fine print through a convex glass at a greater distance than its focal length. 3. When the near point lies at a greater distance from the eye than is proper for the age of the patient."—*Copeland & Ibershoff.*

The first proposition is the positive method of determining manifest hyperopia and its measurement. Manifest hyperopia is measured by the strongest convex lens which does not reduce distant vision. If we examine this proposition carefully it is evident that an amblyopic eye as well as one with unimpaired visual acuity can thus be measured. Various means of relaxing the accommodation should first be employed. The most successful one and the simplest is to have the patient wear a strong convex lens for a short period before the test is made. This may be from fifteen minutes to half an hour. When the manifest hyperopia is determined we have only begun the case. The next step is to determine with clinical accuracy the amount of total error. This is termed hyperopia totalis and unless this is done

we cannot hope for a satisfactory result. Now it is the latent error which complicates the case. It is claimed that there is no known means except a cycloplegic which will reveal and enable us to measure this form of hyperopia. Let us next examine the third proposition from Copeland & Ibershoff that *"Hyperopia is present when the near point lies at a greater distance from the eye than is proper for the age of the patient."*

For the convenience of my readers there now follows the table of the amplitude of accommodation for easy reference and to fix in their minds first and last that "near point" always refers to the age of the patient and not the near point of 13 inches of the presbyope—a mistake I find only too common.

Amplitude of Accommodation—

Year	Amplitude of Accommodation in Diopters	Near Point in Centimeters	Near Point in Inches	Year	Amplitude of Accommodation in Diopters	Near Point in Centimeters	Near Point in Inches
10	14.0	7.0	2.8	45	3.5	28.0	11
15	12.0	8.5	3.3	50	2.5	40.0	16
20	10.0	10.0	4.0	55	1.75	55.0	22
25	8.5	12.0	4.7	60	1.0	100	40
30	7.0	14.0	5.6	65	0.75	133	53
35	5.5	18.0	7.0	70	0.25	400	160
40	4.5	22.0	9.0	75	0.0		

This table of the Amplitude of Accommodation is generally accepted as correct. You will find variations in your practice, but these variations are of no moment. An excess will be of benefit to the subject—a lack can easily be supplied—and there you are.

Referring to the table above we find that a patient aged 20 years has 10 diopters of accommodation and a near point of 10 c.m. Assuming a manifest hyperopia of 2 diopters and 3 diopters latent—a total of 5 diopters—what will be his "near point?" To overcome the Ht. he will require 5 diopters of accommodation. His near point then will be $10 - 5 = 5$ diopters or a near point of 20 c.m. instead of the 10 c.m. of the emmetropic. If this is correct then I am justified in the following conclusion: That *latent hyperopia does not exist at the near point.* Why not? This is a reasonable question though not the question of a reasoner. According to the table referred to the maximum amount of accommodation at the age of 20 is 10 diopters. Hyperopia latent and manifest calls into play an additional amount of accommodation to overcome it, hence this must be deducted from the accommodation available at this age. Again, a patient the same age reveals upon examination a near point 15 c.m. which equals 6.6 diopters accommodation. This amount subtracted from 10 c.m. the near point at this age would indicate 3.3 diopters Ht.

Another proof that the "near point" is an accurate means of de-

termining the sum of the manifest and latent hyperopia is the fact noticed by all authorities that the latent hyperopia becomes manifest as age with its diminishing amplitude of accommodation progresses and that in regular order.

All of the textbooks give directions for measuring the amplitude of accommodation. We have not as yet determined which is the best and most accurate method. Perhaps in view of its great importance to the non-medical refractionist a new, simple and more accurate method may yet be invented.

Theoretically the emmetropic eye should be able to force itself to see 20/20 through a concave lens equal to its amplitude of accommodation. That is, an emmetropic eye of 10 diopters of accommodation should be able with its maximum power exerted to see 20/20 with a —10.00 lens. I am not prepared to state definitely that this is an established fact. If it is then it would be a simple method of measuring the accommodation at all ages. So far in my own experience I have failed to confirm it.

The second proposition that *hyperopia always exists when the patient can read fine print through a convex lens at a greater distance than its focal length,* is undoubtedly correct. I have not used this method in estimating the *total* hyperopia.

Correction of Hyperopia. The correction of hyperopia is far more difficult than the correction of myopia. The accommodation constantly modifies the perscription during that period of life when latent hyperopia is still present. This period usually lasts until the age of 45. We all know how simple it is to correct the hyperopia of the presbyope, and how difficult it is to correct it between the ages of 20 to 30.

The principal difficulty lies in determining how much reserve accommodation the patient needs. Bookkeepers, stenographers, typists and all occupations where the eyes are employed in constant close work, six to eight hours daily probably require more reserve accommodation than those who perhaps may only engage an hour or two daily in close work. The latter would not need as strong lens as the former. Another point to be considered is the high degree of hyperopia where the correction of the manifest alone is not sufficient to give relief and when the latent or part of it is corrected distant vision is impaired. A student in the class room must have clear distant vision and must also be corrected sufficiently to relieve his asthenopia. These cases must be treated in the same way one would prescribe for the presbyope and that regardless of age; however, it is our duty to give relief to the patient and prescribe that which will give the best results. Bifocals will often be required in cases between the ages of fifteen and thirty—a thing that is not usually done; but that alone does not make it the wrong thing to do.

In hyperopia complicated by convergent strabismus, bifocals should be the rule instead of the exception. I am afraid that the fear of criticism is often so great that we follow the beaten path rather than face it.

The quotation that now follows has been my guide for many years in the treatment of hyperopia and I earnestly urge the optometrist to study and digest it thoroughly:

Donders (pp. 278-279): "In speaking of hyperopia and asthenopia: The first thing we have to do in asthenopia is to determine the degree of hyperopia; in other words, to examine what is the strongest convex glass with which the vision of distant objects becomes acute. *This glass is, however, seldom sufficient completely to guard against fatigue in close work.*" But it is only when the patient can do this without any inconvenience and when, moreover, with these glasses the *binocular near point* lies but a little farther from the eye than in the emmetropic organ at the same age, we can determine in favor of commencing their use. "Also that the correction of hyperopia manifest alone is seldom sufficient to give relief."

"I very seldom also find in asthenopia to have recourse to the employment of mydriatics for the determination of hyperopia," and on page 280: "We wish gradually to give stronger glasses and, therefore, we investigate from time to time in our asthenopic patients the position of the relative region of accommodation."

I wish particularly to call your attention to the last paragraph of this quotation. A fascinating problem is suggested by a patient of 20 who has 5 diopters of hyperopia at the start—all latent. This patient in his occupation, which is that of teacher, must have clear distant vision at all times. What would his prescription be at 20, 30, 35 and 40 years of age?

I have italicized in the quotation from Donders the reference to fatigue in close work when the manifest hyperopia alone is corrected, and his reference to the binocular near point.

One examination is seldom sufficient in which to base a final prescription. Whenever practicable and the cooperation of the patient can be secured temporary lenses should be prescribed, especially for those engaged in close work. In this manner the manifest error is more correctly determined and a guide to the amount of correction of the latent error which is necessary for the comfortable maintenance of near vision.

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A CASE OF RETINAL CONGESTION DUE TO SYPHILIS

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The past few years have witnessed considerable progress toward a mutual understanding and helpful cooperation between the medical and optometrical professions. It is hoped that this progressive and helpful spirit continues. Despite the advances made there are many physicians who still harbor the idea that the optometrist is an illiterate quack, wholly incompetent, who should be exterminated. The sooner these men are taught to realize what the average practicing optometrist of today knows and does, the better for patient and practitioner. The indifference to, or the reluctance with which reports on ocular conditions by optometrists are accepted, prompts the reporting of the following case:

No. 3604:

Mr. H. F.—Age 52 years—Occupation: Carpenter. First seen on July 11th, 1927, complaining of occasional headache and inability to do close work with comfort. Wearing at this time, O.U. + 2.0 D. Sph. for near work which was prescribed for him about three months ago. Thorough examination failed to reveal any pathology or muscular anomaly. We prescribed O. U. + 1.00 D. Sph. with an addition of + 2.0 D. Sph. for near work made up in fused bifocals. Patient reported back in two weeks for post-examination and stated that his glasses were "very, very satisfactory." His refraction checked with our former findings and no pathological signs were noted.

On September 5th, 1927, he came to the office complaining of occasional attacks of slight dizziness with severe headaches. Examination revealed no change in his refractive status, but we found a slight retinal congestion in the right eye. The left eye showed a marked retinal congestion suggestive of some kidney disturbance. This was reported to his family physician to whom he was immediately sent. His doctor told him that his dizziness probably came from some slight stomach disturbance and that his blood pressure showed a slight elevation which might have some bearing on his discomfort, for which he prescribed. In the ensuing two weeks the slight dizziness complained of became a marked vertigo with intense temporal and occipital headaches which incapacitated him for two and three days at a time. His doctor told him that his blood pressure was down and that his stomach condition had cleared up and that his discomfort was undoubtedly due to eye strain, advising him to consult an oculist.

On September 22nd, 1927, he came to the office giving us the above history. Examination revealed no change in his refractive status and visual acuity was normal. The retinal congestion in the right eye was but little, if any, more marked than when we saw him on September 5th. The left eye showed a rather marked retinitis and some suspicious gray streaks in the upper and outer quadrant of the disc. We reported this to his physician, stating that we were sure there must be some kidney disturbance or infection, probably luetic, that was causing this condition. His doctor then examined a specimen of his urine and pronounced it normal. His blood pressure being somewhat above normal he was given treatment to reduce it. In the meantime his vertigo and headaches became so bad that he could not work more than one-half the time. Being kept on treatment to reduce his blood pressure and, without further examination by his doctor, he realized that he was rapidly getting worse and discontinued treatment, coming back to me for further ocular examination, this on the 10th of February, 1928.

At this time refraction checked and found O. K., visual acuity in the distance fields (with correction) being 1.2 and he read .50 M type at .75 M with the right eye. With the left eye he could read 1.0 M type at .50 M but it was slightly blurred. Pupillary reaction to light and accommodation in the right eye appeared to lag, in the left eye the reaction was very sluggish. There was a slight aniscoria. There was a marked retinal congestion in the right eye and the left eye showed a well defined papillitis, the physiologic cup was obliterated and the disc showed many small grayish stripes. He was promptly referred to another physician, with a complete report of his case, who immediately had a Wassermann test made which was returned from the laboratory on February 13th as four plus. Patient was immediately put on intensive luetic treatment and when seen today, February 21st, 1928, he reports that he has been free of pain for the past two days and that there has been no blurring of near vision with the left eye. Examination shows a much improved fundus, the physiological cup having reappeared and the congestion markedly less. The grayish striping of the disc remains, probably atrophied fibres.

It is interesting to note that this patient stoutly denies any venereal history. We do know that he spent many months in the tropics while in the army and we take his denials *cum grano salis*.

The lack of intelligent medical cooperation permitted this patient to go without anti-luetic treatment for a period of four months. What permanent ocular damage has resulted from this neglect remains to be seen.

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EXERTION OF INTERNAL RECTI CAUSING CHANGE OF REFRACTION—A CASE REPORT.

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Patient, female, age 18, was brought to me by another optometrist who wished me to observe the unusual change which took place in her refraction when the internal recti were forced to function. The patient had a very slight alternating divergent squint and made no effort to maintain binocular vision except when called upon to do so by the examiner. This condition had been present since childhood and two brothers were similarly affected. She could, however, with some effort, fix any stationary object binocularly, although in so doing there was a decided effort noticeable, such as a swelling of the cords of the upper cheek, a bulging of the cords of the temples and a decided setting of the jaw.

She said that when she used both eyes the object viewed became very blurred. The findings upon examining her monocularly showed a hyperopia of 1 dioptre, which when corrected with a +1.00 D. Sph. gave normal vision O. D. or O. S. Asking her to fix with both eyes however brought only the statement that the letters seemed very blurred. A skiametric examination made while she was viewing a large "E" binocularly disclosed a myopia of 2 dioptres and when the —2.00 D. Spheres were incorporated in the trial frame she claimed to have normal binocular vision, being able to read the 20/20 line. A reduction of one-half dioptre reduced vision to 20/40. When she relaxed, though, monocular distance vision through the —2.00 D. Sph. was impossible, she being able to make out the 20/40 line but finding it much smaller in size than without it.

In this case, evidently, the pressure exerted by the internal recti upon the globe of the eye increased the anterior-posterior diameter of the eye to such an extent as to change its refractive status from a hyperopia to a myopia. In this case a 3 dioptre change was effected.

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KNOWLEDGE OF PATIENT'S WORKING CONDITIONS ESSENTIAL IN MAKING A DIAGNOSIS

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We well know that the optometrist has many duties in his specialized service to the public. Foremost in the minds of the conscientious optometrist is his duty to his patients in regards to everything concerning their eyes. Particularly to give them the ultimate comfort they wish to receive from glasses, as far as it is humanly possible.

There are several factors that enter into this human side of our professional work which I believe are as valuable to us as some of the basic laws which we use every day. Listing three of these factors we find them as follows:

(1) Psychology of patient.
(2) Phraseology effect on patient.
(3) Conditions and surroundings of patient's life.

(1) Taking the first Psychology of the Patient, may also be termed as mannerism of the patient. There are two sides to every person, which I shall term for convenience, the inner side and the outer side. The inner side is that mannerism that is not brought forth until the person is placed to some trouble and inconvenience that heretofore has never appeared or annoyed him. The outer side is that jovial or plastic veneered shell which is very thin but sometimes hard for the examiner to pierce. Thus I find that to complete the most competent examination, this veneered shell must be pierced and the inner self of the patient brought to light.

(2) The second or Phraseology effect on the patient opens the path to the patient's most inner self. The effect that the examiner has upon one he is about to examine partially determines the trend of mind as to whether the patient will cooperate during the examination and throughout the first few weeks of wearing the glasses. I have often noticed a person who seemed to resist the good intentions of the examiner and invariably they had some complaint about their glasses in a week or two. This was the result of the examiner not being able to break down that thin shell of the patient's outer self and reach the most inner nature. This is due many times to the phraseology of the examiner in conversation with the patient, in which I may also include his personal and ethical carriage as the most and only direct method of getting beneath the surface. Our conversation and ethical carriage should be great enough to override any skeptical power thrown off by the patient. Until we have obtained this knack,

we may not be able to fathom the patient or make ourselves clearly understood.

(3) The third and last point or conditions of patient's life and occupation is the most important one from the standpoint of this paper, but we must have obtained the first and second to obtain a complete understanding of the third. If we have solved the psychology of the patient and he appears to cast away some of the veneered surface, we then have a very good chance to learn more about his living and working conditions. Using all the dexterity which we have or may have acquired in getting the facts of these conditions it still is very easy to be misled in reference to his occupation. More and more with the vast improvements which we are undergoing, in this present era, are demanding of us a wider knowledge of existing working conditions. No matter what the occupation may be, we as men in whom a patient has put his trust, should have a fair understanding of his working conditions. We should do a little more than rely upon his answers in regards to his work. We should be able to picture this man at his desk, machine, etc. To do this you will agree that we must have a fairly comprehensive knowledge of many different phases of the world's occupations. This requires the best part of a man's life to obtain, but I dare say that if we would take advantage of every opportunity to study those conditions we could soon acquire a vast number in a short period of time. In fact we should make it our business to familiarize ourselves with as many occupations as possible.

I find innumerable cases in which the distance correction has been correct but the poor conception of the patient's occupation has made him turn from one doctor to another in seeking relief and aid at his daily task. In this matter I absolve the patient from all blame, even though he may mislead you in his answers as to his working conditions and range of focus. For if you relied upon his answers all throughout the examination you are perhaps sadly amiss in your corrective prescription.

Knowing that it is human to fail at times, it would be a supernatural event if every case were satisfactorily prescribed for. It seems that we err so humanly that it is well to be reminded of the fact once in a while and be on our guard as we profit by someone else's mistakes.

The following four cases are cited to show the need for an exact knowledge of the patient's working conditions before an ocular prescription can be written:

Case One

Patient—Male, age 45. Occupation, cloth mender. Examination showed eye grounds normal and physical health good. Pathology lacking in eye. Symptoms were an inability to do his work properly due to lack of ability to see clearly and comfortably. Patient had been

examined about six weeks before by some practitioner and had had the following prescribed:

O. D. + 0.75 D. Sph. ⊃ + 0.25. D. Cyl. axis 90.
O. S. + 1.00 D. Sph.
Add O. U. + 1.50 D. Sph.

This correction was used for three weeks and was found to be unsatisfactory, and was then supplemented with a pair of glasses for part time use as follows:

O. D. + 3.50 D. Sph.
O. S. + 3.50 D. Sph.

These, too, proved of little value and the case came to me as stated. My first refraction was made at 4:00 P. M. after the patient had been using his eyes nearly all day. The findings were as follows:

O. D.+1.00 D. Sph. ⊃ + 0.25 D. Cyl. axis 100, ⊃ 2Δ Out, ⊃ 1Δ Down.
O. S.+1.00 D. Sph. ⊃ + 0.25 D. Cyl. axis 75.

Add O. U. + 1.25 D. Sph. for a 30 to 34-inch range.
Add O. U. + 2.50 D. Sph. for a 13 to 15-inch range.

In the above we note that the patient's accommodation was relaxed at an early stage in life. This I believe due to the type of near point work he has been doing and partially to the lack of a distance correction.

The second examination or post-refraction done at 9:00 A. M. the following day disclosed the same findings with the exception that the hyperphoria and esophoria had disappeared.

The ductions now seemed normal and have stayed so on subsequent examinations.

Having viewed the process of mending and inspecting cloth for broken threads I am somewhat familiar with the procedure, which is very simple but quite tedious. The cloth is from 36 to 56 inches wide and passes over and through two rollers. As the cloth slowly passes downward the inspector carefully looks for broken threads or short ends. This work is done from 30 to 36 inches away from the moving rolls of cloth. As a broken thread appears the inspector bends forward, taking up the broken thread with a "needle" sort of a device. His distance is now from 13 to 15 inches according to the fineness of the "picks." He therefore has two working distances. A 30 to 36-inch range for inspection and a 13 to 15-inch range for the repair work. Obviously neither a pair of + 3.50 D. Sph. nor a compound correction of about + 2.25 D. Sph. will do. He must have both, and by prescribing the following correction, complete relief was obtained:

O. D. + 2.25 D. Sph. ⌒ + 0.25 D. Cyl. axis 100.
O. S. + 2.25 D. Sph. ⌒ + 0.25 D. Cyl. axis 75.
Add O. U. + 1.25 D. Sph.

This correction prescribed for his work only. The distance vision being taken care of with a separate set of glasses for this purpose.

Case Two

Patient—Male. Age 27. Occupation, weaver. Examination showed the eye grounds to be normal. His uncorrected visual acuity was O. D. 20/100. O. S. 20/200. Health normal. Unable to get comfort at work as far as eyes are concerned. A previous examiner had prescribed the following correction which gave no comfort. He had returned several times to this refractionist but nothing was done to improve matters.

O. D. —1.00 D. Sph. —3.50 D. Cyl. axis 15. V. A.=20/30.
O. S. —3.25 D. Sph. + 4.00 D. Cyl. axis 90. V. A.=20/70.

After a complete refraction I found the working range of the unsatisfactory correction was too far away and by prescribing the following correction, gave him a working range which was entirely satisfactory:

O. D. —3.50 D. Cyl. axis 90.
O. S. —1.25 D. Sph. ⌒ + 4.00 D. Cyl. axis 90.

Case Three

Patient—Male. Age 43. Occupation, organist in theatre. Complained of an inability to do near work with comfort, particularly his music. He was wearing the following correction:

O. D. + 0.50 D. Cyl. axis 90.
O. S. + 0.50 D. Cyl. axis 90.

A complete examination disclosed nothing of great interest. There was no pathology present, and his ductions were normal. The following correction gave him a normal acuity of vision for distance:

O. D. + 0.50 D. Sph. ⌒ + 0.37 D. Cyl. axis 90.
O. S. + 0.50 D. Sph. ⌒ + 0.37 D. Cyl. axis 90.

but was unsatisfactory for near work, which in his case was done at about 18 to 20 inches. Some experimental work disclosed that an addition of O. U. + 1.00 D. Sph., would give him comfortable and normal vision at this point, however it fogged him at a distance, and as his work required both distance vision, to see the pictures, as well as near vision to see the music, I was forced to prescribe a bifocal correction. Obviously the ordinary type of bifocal correction would not do inasmuch as the lower portion was too small to give him the field needed at the organ. I therefore had made up an inverted cement bifocal, the lens being as follows:

O. D. + 1.50 D. Sph. ⊃ + 0.37 D. Cyl. axis 90.
O. S. + 1.50 D. Sph. ⊃ + 0.37 D. Cyl. axis 90.
Add O. U. —1.00 D. Sph.

This wafer being placed at the top of the lens. This completely solved his problem.

Case Four

Patient—Male. Age 54. Occupation, paperhanger. I had refracted this case in 1925 and had prescribed:

O. D. + 0.25 D. Sph. ⊃ + 0.75 D. Cyl. axis 165.
O. S. + 0.37 D. Sph. ⊃ + 0.37 D. Cyl. axis 165.

for distance wear with a O. U. + 2.00 D. Sph., added for reading, to focus at 14 inches. This pair of glasses was supplemented by a pair of working glasses which focused at about 22 inches. These glasses were as follows:

O. D. + 1.50 D. Sph. ⊃ + 0.75 D. Cyl. axis 165.
O. S. + 1.62 D. Sph. ⊃ + 0.37 D. Cyl. axis 165.

These corrections were used for about two years and the patient returned saying the corrections were no longer satisfactory. A complete re-examination revealed that the patient could now stand more plus which was given as follows:

O. D. + 0.75 D. Sph. ⊃ + 0.75 D. Cyl. axis 180.
O. S. + 0.75 D. Sph. ⊃ + 0.37 D. Cyl. axis 165.

Add. O. U. + 2.50 D. Sph. for reading distance. The working correction was changed to

O. D. + 2.75 D. Sph. ⊃ + 0.75 D. Cyl. axis 180.
O. S. + 2.75 D. Sph. ⊃ + 0.37 D. Cyl. axis 165.

which proved to be very satisfactory. The only way a patient of this type can possibly get along is by the use of several corrections, each with its special focal points.

Many other cases could be submitted but I believe the four shown indicate nicely the necessity of clearly knowing just to what use the patient is going to put the correction, before we prescribe it. To carelessly assume that the patient's working distance is so-and-so is to invite complaints.

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CASE OF A SLIGHT CONGESTION OF THE CONJUNCTIVA RECURRING EVERY EVENING FOR A SHORT PERIOD BETWEEN 6 AND 7 O'CLOCK

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Patient: A banker, first came to me for an ocular examination early in November, 1927. He complained of the general symptoms peculiar to hyperopia, such as frontal and occipital headaches, asthenopia, excessive lachrymation and a feeling of sand in the eyes. During the few days preceding his call these discomforts had been growing rapidly worse, until they had become almost unbearable.

The retinoscope apparently showed plainly that the refractive error was too slight to cause all the trouble, so I proceeded to make an ophthalmoscopic examination immediately—reversing my usual procedure, since I usually use the ophthalmoscope as a finale, preferring to keep the cornea as free from tears as possible during the search for refractive errors and muscular anomalies. The iris seemed to be slightly swollen, and there was marked marginal blepharitis. During the examination fine pink vessels began to show through the sclera near the cornea.

I gave the patient smoke glasses in number two shade, and sent him at once to his physician, whom I phoned offering the information I had obtained along with the suggestion that acute iritis was suspected. The physician corroborated my diagnosis and had the man report as soon as possible to the hospital, where he was kept in a dark room and given the usual treatment administered in such cases. The patient was discharged as cured in about two weeks.

On January 20th, 1928, patient again called at my office for examination and glasses since near work, which he does continually, was bothering him. Although he asked for reading glasses I figured that his trouble was the slight hyperopia found in the first examination, since he is only thirty-seven years old. Static retinoscopy revealed an error of O.U. + .50 D. Sph. and the ophthalmometer registered only a physiological half dioptre of corneal astigmia. Visual acuity was only .8 with this correction. Phorometer tests disclosed 2 diopters of esophoria; abduction was 8 and adduction only 18 P. D. There were no vertical phorias. Ophthalmoscopic examination was

negative except for small white lines following the vessels for a little distance out of the discs. The prescription given was O.U. + .50 D. Sph. to be worn for near work at first, but continually afterwards. Since then I have seen the patient often, both on the street and in his office, and I have never seen him without his glasses—and as far as I knew they were giving the perfect satisfaction I had intended they should.

Just recently I had the pleasure of attending a banquet which was also attended by the patient, and I was fortunately seated directly across the table from him. Soon after we began our feast I noticed that he removed his spectacles and rubbed his eyes vigorously. A minute or so later he repeated the procedure and I noticed that his eyes were becoming very congested and that tears were rolling down his cheeks. When I questioned him later he told me that at about the same hour nearly every evening his eyes would begin to smart, and that it would last about five to ten minutes, when they would again return to normal and he would feel all right—just as I had witnessed a few minutes before. Later in the evening I played cards with him and noticed that the inflammation had entirely disappeared.

In my practice I have never had a case of this sort nor have I read of one in optometric literature studied. I can advance no satisfactory theory as to the cause of this recurring congestion which affects him so strongly for a short period, early every evening. The patient has experienced this disorder regularly now for nearly four weeks.

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OCULAR PSYCHOMETRY

Being an Outline of the Fundamental Principles Governing the Control of the Ocular Muscles.

By
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Chapter VI.

Before attempting discussion of either probable results anticipated from, or the explanation of, results already demonstrated through, Oculo-calisthenics, it is necessary that our understanding of the structures involved be clear in mind. For that reason this chapter will briefly review subjects with which the reader is undoubtedly already familiar, from the practical and experienced—rather than the student—viewpoint.

The first thought is, naturally, of the muscle structure. The muscles of the eye are among the "reddest" muscles of the human body. More like the muscles of the rabbit than any of the others. Hill[28] classes them with the muscles of respiration and mastication. Eye muscles are primarily intended for continual flexing. This together with the fact that the eyeball is so well "lubricated" and "mounted" in the folds of connective tissue and orbital fat that it is a practically frictionless "ball bearing," would indicate that Nature intended the eyeball to be in practically continual motion; and it is obvious that eyes of primitive man, and even the majority of civilized men, excepting within the last few generations, were in constant motion; the gaze roving constantly from one extreme of the visible field to another. The fixed gaze and hours of concentration upon one definite point, or a printed page, are products of contemporaneous civilization, and are as yet "new" visual requirements.

Further examination of the muscles discloses that each one consists of numerous long slender bundles of fibrils wrapped up in connective tissue, and between these smaller bundles, inbedded in the connective tissue lie the veins and arteries which supply nourishment to the muscles themselves. Enclosed in the tendinous capsule surrounding the muscle are the six to eight "muscular anterior" arteries which supply the ciliary process and muscle of accommodation of each eye.

It is common knowledge that when a muscle of the arm is constricted or tensed, it becomes outwardly more resistant to the pressure of an exploring finger, so it is readily understood that when the extrinsic ocular muscles are constricted they likewise become "hard" and the bundles of muscle fibers press against the veins and arteries lying between them so that circulation is considerably inhibited during taxation of the muscles. When the muscle is again relaxed, the blood is permitted to flow more freely, so that taxation followed immediately by relaxation and rhythmically repeated (similar to the principle employed in filling an "eye dropper") tends to increase circulation so the tissues involved will receive increased nourishment commensurate with the increased work.

It is well agreed by physiologists that no blood directly enters any cell of the body but that "the blood feeds the lymph and the lymph feeds the cell" and that every living cell is bathed in lymph.

Lymph is a colorless fluid produced by the arterial blood which, upon chemical analysis varies according to the tissue in which it is found.[29]

Very little has been written on the subject of Lymph but Millard[30] makes it clear that lymph having bathed the cell in fresh nourishment, and having absorbed the products of catabolism and synthesis, passes from the tissue through lymph spaces, thence through a chain of "nodes" or small vessels communicating each to the next through a small valvular opening, finally pouring the toxin laden lymph back into the blood stream of the veins. However, a great portion of the lymph, particularly from the eyes, is not emptied directly into the veins, but is carried through the lymphatics, down the neck to the clavicle vein. Dr. Glenn S. Moore states:

"We have a triple lymphatic drainage from the eye by way of first, the eyelid, through the buccal and submaxillary lymph glands of the head to the superficial lymph glands of the neck. Secondly, this drainage is by way of the anterior lymph channels of the eyeball (canal of Schlemm and spaces of Fontana and anterior posterior chambers) all draining to the internal maxillary lymph glands. The third avenue of drainage is by way of the posterior channels of the eyeball (Hyaloid canal, supra and infra-vaginal lymph spaces and perichoroid lymph space) all draining to the subdural and subarachnoid spaces of the brain."

The lymphatics are not supplied with a vaso-motor system as are the veins and arteries, but depend largely upon mechanical action to maintain circulation; therefore, the natural constant movement of the eyeball is of great importance in removing the toxin laden lymph from the ocular tissues.

The lymph spaces of the eye are too numerous to individually mention in an article of this length, but they are found between lay-

ers of every tunic, between the tunics, in the layers of the optic nerve, and between tendinous capsule and whatever it surrounds.

The three humors of the eye answer to the description of lymph and it is not too much to expect in the not distant future, appreciable strides toward the elimination of errors of refraction and even the prevention of presbyopia and cataract through careful study and a deeper knowledge of the lymph drainage of the eyes. More immediate results, however, can be expected in comfort and efficiency of the ocular muscles through lymph drainage induced through proper calisthenical exercises of the eyes.

Each muscle cell is, in itself, a complete muscle in that the action of the muscle as a whole is but the United effort of the individual cells. Each muscle cell consists of a little sac, known as a "sarcamere" containing a fluid substance usually called the "contractile fluid." When stained with hematoxylin (logwood acid) the contractile fluid is found to contain two elements, one of which has an affinity for the stain, while the other has not. Dunlap[31] has called one type "anisotropic" and the other "isotropic."

The extrinsic muscles stain striped because the anisotropic and isotropic elements are found in distinct layers. The intrinsic muscles however on the other hand, stain plain, because these two elements are not clearly defined but mixed; therefore, the stain is taken on as a whole.

When the muscle is "resting" or reacting to an inhibitory nerve impulse, the isotropic and anisotropic elements seem to repell each other, making the cells long and slender. Under the influence of a mandatory impulse, the elements of the contractile fluid seem to attract each other, tending to produce a spherical shape to the sarcamere, just as all bodies tend to assume a spherical form when the constituent elements exert a mutual attraction.

Whether extended or contracted, there is no change in the total volume of the muscle cell. The change is of shape only, so that as a muscle "swells" during constriction, it becomes proportionately shorter, thereby performing the "work" for which it is intended.

Any change, especially movement, is a demonstration of energy released. In this mechanical age, it is natural for us to compare muscular activity to the combustion engine. Combustion (oxidation) does actually take place within the muscle cell, but the process is somewhat of a surprise to the mind filled with automotive knowledge.

Hill[32] points out that glycogen (muscle sugar) is the fuel supplying the energy for muscular activity. When the nerve impulse is discharged into the muscle cell, the glycogen breaks up into lactic acid, constriction occurs immediately in a sort of wave traveling away from the point of stimulation; and *the individual cell shortens to the limit of its ability* according to the favored "all or none theory."

If the entire muscle does not contract to its fullest extent, it is because the impulse is not discharged into every cell, the number of cells acting being in proportion to the amount of work to be accomplished, and the tendency of the inactive cells to offer resistance rather than aid.

When the mandatory impulse is suspended the constricted cells are relaxed and the circulatory system supplies fresh oxygen in the presence of which most of the lactic acid returns to glycogen; but some of it is "consumed" forming carbonic acid gas, which is promptly absorbed and carried away, but suppose the mandatory impulse is maintained for long periods, with insufficient or no intervals of relaxation; circulation would thereby be inhibited by pressure and lymph drainage likewise retarded.

Insufficient oxygen results in an overproduction of lactic acid; inefficient drainage results in accumulation of lactic acid and carbonic acid gas. The latter tends to imprison the impulse—that is, to keep the cell constricted, and the result is termed "cramp," manifest in certain cases of esophoria and of "latent hyperopia" or "pseudomyopia."

The former, lactic acid excess, has much the same effect upon the contractile fluid as it has upon milk.

As the lactic acid accumulates within the muscle cell, the contractile substance loses its fluidity (the viscosity increases) and the cells affected offer greater resistance to the effort of the other cells of the muscle, so the muscle becomes sluggish in action, "stiffness" and "soreness" is soon experienced.

The discomfort of the ocular muscles are usually described as "eye strain headaches." Sluggishness of the ocular intrinsics is probably responsible for much premature presbyopia. Sluggishness of one or more of the ocular extrinsics may account for much eso-, exo-, hyper-phoria and so on, especially in those frequently discovered (when sought) cases wherein the error changes in kind or degree as both eyes are turned to the right, or to the left, or up or down.

Inefficiency of the ocular extrinsics, or of any group or "team" may frequently and easily be discovered by observing the patient's inability to maintain constant precise fixation of an object moving at an absolutely unwavering pace through a mathematically exact pattern or path, or by other simple means. Although the human eye is obviously a mobile organ, mounted and muscled for effortless, instant, accurate movement, and so constructed that almost constant rotation is essential to its well being and continued efficiency, and in spite of the fact that the eyes of man have enjoyed the faculty of rotation through an angle of approximately 40° in any direction for countless centuries, great numbers of "refractionists" continue to examine and treat human eyes as if they were rigidly fixed in the for-

ward looking position and incapable of conjugate movements in all directions—laterally and vertically as well as in convergence.

During the rigid fixation of a motionless object, the extrinsic ocular muscles are tensed as the arm muscles would be if the finger were held pointed at the same target. During the first few moments the fixation is maintained with little or no conscious effort, but shortly the sensation of "fatigue" appears; then, if the effort be sustained beyond the "fatigue" point, "strain" is experienced which frequently has an aftermath of nervousness and aversion to the work requiring such fixation and discomfort.

The explanation of "fatigue" is, in addition to the foregoing outline of the effects of excessive sarcolactic acid, to be found in considering the attachment of the nerve fiber to the muscle fiber, and the effect of lactic acid accumulations at the point of contact.

The nerve fibers are attached to the cells of the intrinsic ocular muscles (which are not usually responsible for fatigue and strain) in the form of a process—that is the nerve fiber has many points of contact with the muscle cell. However, the nerve fibers to the extrinsic muscles which are usually responsible for fatigue and strain are attached by means of an "end plate" which forms a single point of contact between nerve cell and muscle cell.

During the first few moments of motionless fixation, the contact at the end plate is good, only a low "voltage" of nervicity being required to pass from nerve to muscle; but as the stimulation continues and the lactic acid accumulates around the end plates, acting not unlike corrosion of any electrical contact, the muscle becomes insulated from the nerve and a higher "voltage" of nervicity is required if the impulse is to reach the contractile substance. The higher potential of nervicity required is obtained by consciously directing a mandatory impulse toward the task at hand. The more conscious one becomes of "concentrating" on fixation, the more he complains of "tired eyes" or "fatigue."

When any cell of the body is caused to function unrelentingly until all its stored-up nourishment is consumed the cell is said to be "exhausted" and ill effects of "strain" increase as the point of exhaustion is approached. When exhaustion of any cell occurs as a result of eye strain, it is obviously brain cell exhaustion, if we accept Sherrington.[33] Crile[34] states that the brain cells exhaust fifty times faster than muscle cells.

It has been shown that lymph is produced in greater quantities, is drained more efficiently, and that the circulation of blood increases, with exercises of the natural functions of an organ.[35] It is therefore obvious that rotation of the eyeball, a natural function, tends towards the production, distribution and elimination of lymph.

One need not be radically optimistic to anticipate great advance-

ment in the success and prosperity of the profession of optometry now that it has facilities for supplying that primitive and alienable rhythmic exercise of the extrinsic ocular muscles which modern civilization denies.

[The next chapter will discuss the natural development of the normal pair of human eyes; Shepard and Mendelsohn suggesting a technic for the Optometrist to improve the condition of eyes that are other than normal.]—EDITOR, AMERICAN JOURNAL OF OPTOMETRY.

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A CASE OF HYSTERIA

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A little girl, about eight years of age, reported to me on January the 18th of this year. Though she was accompanied by her parents, I made her tell me her story in her own way, as she seemed to have the intelligence and general make-up of a girl much older. Her story was as follows:

Last summer sometime, she was struck with a pebble on her right temple. This caused her pain for only a short time, but between Christmas and New Year's, she went on, she began to have black spots shooting in and out of her right eye, like fireworks. After a day or so of this, everything went black before that eye, and she seemed totally blind.

I tried to take the vision in the right eye, excluding the left entirely. She was unable, she stated, to see the letters, nor even the test chart itself, at the other end of the room. I tried the finger test, but she was unable to see my hand in motion within a foot of her eye. I removed the head from my retinoscope and brought the light close to her eye, but the girl saw nothing but blackness. Then I used the pinhole disc, but she was unable to see the hole in the disc, when I was quite positive that it was in direct line of vision. My retinoscope statically showed + 1.50 D. Sph. I used my ophthalmoscope and it showed a perfectly normal fundus in the most minute details.

I then slipped a + 2.00 D. Sph. into the trial frame and she exclaimed that she was able to see the letters at the other end of the room, which were the 200 feet letters. She was able to read two more lines on the test chart, which brought her vision up to 20/65. Then, of a sudden, she said she could not see anything any more.

It was obvious to me that here we had a case of cerebral trouble and suggested to her parents that she be taken to an ophthalmologist, to which they consented readily. She was taken to Dr. Woolsey, with whom I have collaborated in other cases. Dr. Woolsey reported back to me in about thirty minutes. He said he could find no disease in that eye, or no anatomical reason why she should not be able to see out of it, yet he was unable to make her see anything. I told Dr. Woolsey what I had done, and that she had been able to read three

lines on the test chart, and suggested to him that he make a further research.

In about thirty minutes more, Dr. Woolsey reported to me that he had bandaged the child's left eye securely. He then proceeded to talk to her mother of other things, and found that her supposedly blind eye was following his movements while he moved around the room in a natural fashion, keeping an eye on the girl. He spoke to her in a very decided way, saying: "I know exactly what is the matter with you, and I can put a glass in front of your eye, which will make you see just as good as anybody." He immediately slipped a plano lens in his trial frame, and with this she was able to read everything on the test chart.

We decided to put glasses on the girl for psychological effect only. The next day, at my office, I was able to get binocular vision and decided to give her fusional treatment for a few days. I was also able to get physiological diplopia and the girl was able to read binocularly with a pencil check in the median line of vision.

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AMERICAN JOURNAL OF OPTOMETRY

VOL. 5, APRIL, 1928 No. 4

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Published Monthly by the
American Journal of Optometry Publishing Association.

The Journal has no objection to the reprinting by other magazines of any of its articles, provided such reprints are properly credited to the American Journal of Optometry.

THE FOOT-CANDLE METER IN ROUTINE OFFICE PRACTICE

For the past several years I have used, with no little advantage to my patients, a Foot-Candle Meter in my optometric practice. As this instrument is one used chiefly by Illuminating Engineers, and one seldom even mentioned in optometric literature, I will first describe the instrument and then give its optometric application, following this with several illustrative cases which make its value to us, as optometrists, undoubted.

The Foot-Candle Meter is an instrument devised to measure, in units of foot-candles the degree to which a surface is illuminated. This is done by use of the following formula: The lumen is the unit of light flux quantity. The number of lumens required to light a given surface is proportional to the illumination in foot-candles and to the area of the surface in square feet. For instance, one lumen will light a surface of one square foot to an average intensity of one foot-candle. The Foot-Candle Meter does this effectively and simply, its technic consisting of merely observing or matching the exposed surface illumination, on the top of the instrument, with that of its interior illuminant, as it shines through the exposed screen when the instrument is horizontally placed in the plane of study.

For instance, should one wish to determine the illumination on

one's desk: The Foot-Candle Meter is placed in a horizontal position, face up on the desk with the protective cover taken off the screen. The instrument is then turned on, and one can, almost at a glance, tell, by observing the screen the exact number of foot-candles of illumination at that level and at that point on the desk. In fact, the technical use of the instrument is so surprisingly simple that I frequently have patients use it themselves at their homes or offices where I suspect their visual disorders are aggravated by poor illumination.

Cushing in his annual work, "Standard Lighting," published at 8 W. 40th St., New York City, claims that office workers should be provided with at least 8 to 10 foot-candles of illumination at the working eye level, the illumination being, of course, free from glares. The book mentioned is, in this connection, a splendid one and should be secured from the publishers by those interested in this vital phase of our work. Cushing also gives the minimum quantities of illumination necessary for satisfactorily carrying on various other occupations, thus making his work a splendid reference book.

The routine use of the Foot-Candle Meter in my optometric practice is carried on as follows: First, in patients who have the mental capacity to grasp, in a few moments the technic of the instrument, and who are doing near-point work of such character that a visual fatigue will result from improper lighting, are given the instrument, they taking it to their offices or homes, reporting back the following day with the findings. Second, a much smaller group who are, in my belief suffering from asthenopia due to improper lighting, and who are not capable of handling the instrument, these being accompanied by myself to their places of work, where the illuminating factors are personally checked.

The latter method is naturally to be preferred but the matter of time enters into this work and I have found that surprisingly good results can be obtained by carefully instructing the patient on the matters of eye hygiene and illumination and by a painstaking demonstration of the use of the Foot-Candle Meter, instructing the patient at the same time to make the readings and report back for further instructions. The following cases are illustrative of the value of this procedure:

Case One—Asthenopia in an Emmetrope Due to Improper Lighting.

Patient, Female. Age 26. Occupation, office worker. Patient came to me complaining of headaches, eyes feeling tired, tender to the touch, and such a drawing-feeling in the eyes that her near-point work was fast becoming impossible. The symptoms mentioned had started bothering her about three months prior to her first visit at my office. After I had examined the case it developed that she was employed in an office located in one of the large buildings of the city, her desk being at some distance from a window which opened out into a court.

This made it necessary for her to rely upon artificial illuminants at all times. The examination disclosed nothing of interest. Media clear, retina normal though seemingly slightly pale, no refractive defect, extrinsic muscles normal and no accommodative disturbance present. Transillumination of the sinuses and antrums showed no signs of focal infections, and her teeth seemed in splendid shape. This was later verified in a conversation over the phone with her dentist, who claimed them to be perfect. Her tonsils had been removed some ten years previous, her throat appearing normal in every respect, the surgeon who had performed this operation having done a thorough piece of work, no signs of the tonsils being left. Her health seemed good, she complained only of the distressing symptoms already mentioned.

At this point there were two courses of action open to me. I could, first, insist upon her having a physical examination, a thing she was somewhat reluctant about doing, being positive that she was in perfect physical condition, or I could, second, inquire more fully into her working conditions, trying to find if possible a reason for the discomfort she was suffering. This was done. After a post refraction and considerable discussion regarding her work, the use of the Foot-Candle Meter was explained and its technic demonstrated. She then took the instrument, reporting back the following day that at her desk the illumination varried from two to three foot-candles. Her employer becoming interested in her experimental work with the Foot-Candle Meter had called in the building superintendent who had ordered the inverted light fixtures cleaned and a pair of stronger globes installed. She again made the tests on the following day and found the illumination now about five foot-candles. The building superintendent then ordered the ceiling repainted, the illumination being raised by this to about 7½ foot-candles, which I considered in this case sufficient. All symptoms disappeared within three days after the painting of the ceilings. In this case the patient, a college graduate, took the readings herself, and as the illumination increased, the required results were obtained. I have talked with the patient on two occasions since the above work was done and she has never had a recurrence of the symptoms. She is particular, however, to see to it that the globes and reflecting fixtures are kept clean and that new globes are installed every three months, as I have impressed upon her the fact that the effectivity of the average lighting system depreciates about one-third in that period.

Case Two—The Development in What Appeared to be a Case of Progressive Myopia, Seemingly Arrested by Improving Lighting Conditions.

Patient, Male. Age 19 in the year 1921, the year patient first came under my care. At this time he was a student in a business college, having just finished his high school education. Without going into all the details of this and the subsequent refractions let it suffice

to say that he had, at this time, a myopia, which was corrected with a pair of O.U. — 1.50 D. Spheres. He returned a year later and these were increased to O.U. — 2.50 D. Spheres. In 1924 these were again strengthened to O.U. — 3.50 D. Spheres. He, at this time, was working in the bookkeeping department of a large wholesale seed company, where he is still employed. In 1925 he again returned, this time accepting a pair of O.U. —4.75 D. Spheres, which gave him normal vision and comfort. He happened to mention at this time, however, that the lighting over his desk seemed quite inadequate and that he wished he had some means to improve it. I volunteered to visit him at his office, which I did the following day. A simple change in the position of one light effected an increase of six foot-candles in his desk illumination, it being raised from four foot-candles to ten foot-candles. I have examined him on three occasions since 1925 and have found no change in his correction during this period.

Now I will frankly admit that this is the only case of this nature I have in my files, although I have tried this experiment in two other cases with what might be termed partial success, however, inasmuch as the myopia, in the case reported in some detail, was undoubtedly progressive during the years 1921 to 1925, going from O.U. —1.50 D. Sph. to O.U. —4.75 D. Sph., and inasmuch as his working conditions had in no way changed, the obvious conclusions to be drawn would be that improving the illumination had given him sufficient relief to arrest the development of the myopia. The theory is of sufficient interest to develop further, where possible.

Case Three—Esophoric Patient, Suffering from a Near-Point Diplopia, Relieved by Increasing the Number of Foot-Candles Used at the Working Distance.

Patient, Female, Age 29 in 1926. Occupation, sewing on draperies. Patient complains of headaches and that the moment she relaxes in the slightest degree she suffers from a near-point diplopia. That is, she would see two seams, for instance, both somewhat blurred. The examination revealed a slight hyperopia and a small amount of astigmia with the rule. She had 8 degrees of esophoria and the following correction was given her for near-point work:

O.D. + 0.50 D. Sph. $\bigcirc$ + 0.50 D. Cyl. axis 90.
O.S. + 0.50 D. Sph. $\bigcirc$ + 0.50 D. Cyl. axis 90.

This correction fogged her to 20/30 for distance, and she reported two weeks later that she felt better, her headaches were largely gone but the diplopia continued. She still had 8 degrees of esophoria. It was impossible to treat this case in the usual manner, she living in another city, being unable to reach my office at more frequent intervals than once every two weeks. Discussing her working conditions, it developed that her sewing was largely done under artificial light and from her description, it was none too good. At her re-

quest I wrote the superintendent of the store in which she was employed asking him to give me a report in foot-candles of her working illumination. I received a very nice letter from him saying he would have a member of the local electric company staff come out and give him the findings I had requested, and that he would send them to me later. He also inquired just how many foot-candles of illumination I thought were necessary to enable those in this department to work with comfort? I answered saying I thought at least from 12 to 15 foot-candles would be proper for this type of work. It later developed that the work had been carried on under conditions which gave an average illumination of from five to six foot-candles. The electric company's illuminating engineer suggested certain changes which would increase the illumination to at least 15 foot-candles at the working eye-level, and these changes were promptly made. The patient's diplopia disappeared as soon as the illumination was ample to enable her to get a sufficiently clear image of the object viewed, without undue accommodative and convergence effort. An examination made some three months ago showed an esophoria of 4½ degrees with no other apparent changes.

These cases illustrate the need for our supervision of the illuminating problems of our patients, these problems requiring us to be constantly studying the newer developments of the illuminating engineer and also to be ready to perform a more complete optometric service with the aid of the Foot-Candle Meter.

C. C. K.

BOOK NOTICES.

RECENT ADVANCES IN OPHTHALMOLOGY. W. Stewart Duke-Elder, M. A., D. Sc., Ph. D., M. D., Gh. B., F. R. G. S. Published by P. Blakiston's Sons Co., Philadelphia, Pa. 1927.

Recent advances in Ophthalmology was published recently and covers a wide field of subjects pertaining to the eye. It contains 342 pages, four color plates and 73 text figures. The author attempts to bring down to date all of the subjects having a direct bearing on refraction in general and ophthalmology in particular. The book is divided into 8 chapters.

In the first chapter the author devotes 42 pages to a discussion of the nature of light and its action upon the eye. He reviews all of the older theories of light and then explains some of the newer ones advanced more recently. He lays particular stress on the theory of relativity by Einstein and the gravitational influence upon light.

He goes into great detail about the general biological action of the visible and invisible light upon the ocular tissues, the cornea, iris, lens, and the retina. He dwells particularly on the heat effect upon the lens and claims that infra-red ray and not ultra-violet is the greatest causative factor of cataract.

In chapter two, which is headed as Physiological Optics, the accepted theories of accommodation are reviewed and their shortcomings are pointed out. There is also an extended discussion of physiological and pathological halos and their application in differential diagnosis.

In chapter three, 26 pages are devoted to a description of the normal embryology of the human eye, congenital eye defects and comparative embryology.

Forty pages are devoted in chapter four to a complete discussion of the latest methods of diagnosis, making use of biomicroscopy. The technic of using the slit lamp is described with many illustrations showing the clinical appearances in the cornea, the aqueous, the iris, the lens and the vitreous. Also the fundus examination with the Gulstrand Ophthalmoscope, ophthalmoscopy with restricted spectral light, red free light and yellow green light is explained, as well as biomicroscopy with ultra-violet light, with polarized light, and spectro-analysis.

In chapter five, sixty pages are devoted to a discussion of the general physiology covering the vascular circulation, the intra-ocular fluids, intra-ocular pressures and the application of tonometry.

Chapter six deals with diseases of the eye. The author devotes much space to the pathology of circulation, to the causes, diagnosis and treatments of glaucoma; different types of cataract, and sympathetic ophthalmitis. Here Duke-Elder disputes the generally accepted theory that Glaucoma is caused by intraocular pressure—this he maintains is only a symptom and not the cause. He grants that the pathological condition of both, the arterial and venus pressures, may have an influence upon the development of glaucoma, there are, however, other factors, he claims, independent of the circulation which are contributing to its development, these are: physical, nervous, chemical, hormonal and psychical influences. The development of glaucoma in persons of emotional temperaments have long been noticed.

The general methods of treatment of glaucoma are fully described in the seventh chapter. He explains the methods and technic of the general application of ultra-violet and of local phototherapy. He also explains fully the theraputic action of light upon diseased states, especially of short waved light.

The eighth chapter is devoted to a minute study of neurology, tracing the lower visual paths, the primary visual centers, the central

connections of the visual paths and the monocular and binocular visual tracts, the oculo-motor system and the trigeminal nerve.

The Neuro-psychological foundation of vision is thoroughly discussed, covering the genesis of perception, levels of integration, the motor functions of vision and the syncritic level.

At the end of each chapter the author furnishes a most complete list of references, which will help the studious reader to carry on further study and research upon any one subject in the book, which may be of particular interest to him. This alone makes the book a valuable edition to any scientific library, while in the book itself Duke-Elder has brought up to date a good portion of ocular literature.

J. I. K.

OPHTHALMOSCOPIC DIAGNOSIS. By Dr. C. Adam. Translated by M. L. Foster, M. D. pp. 229. Figures 86. New York: Rebman Co.

Reading matter, without illustrations, of the abnormalities of the fundus is hardly the most satisfactory way to study pathological conditions as seen by the ophthalmoscope. The unthinking refractionist may consider that the fundus at hand should appear as those pictured in text books, to them an atlas is of no use, but, to the refractionist who wants something to guide them in ophthalmoscopic diagnosis much of value can be found in this book.

This book gives illustrations in natural colors of the appearance of the eye grounds in specific cases. With these as a basis the various conditions can be recognized as there are sufficient common markings to identify the disease.

Besides being an atlas of fundus abnormalities divided into different classifications there is a short account of the pathology, prognosis and the treatment. Also there is brief mention of the relation of various diseases of the eye to general disease conditions. This volume is more easily handled than that of Oatman's and can be well used in connection with it.

E. O. F.

ABSTRACTS

TOBACCO AMBLYOPIA. L. M. Smith Clark. The Optician (British). Vol. LXXIV, No. 1904, p. 81, 1927.

Clark, while admitting the possibility of tobacco amblyopia, doubts very much that many of these cases exist, claiming that while it is true that the use of tobacco will affect the digestion and the heart, as well as in some cases the nervous system, she nevertheless has failed to find a single case in her own ophthalmic practice.

T. O. B.

METAL LAYERS FOR EYE PROTECTION. L. G. Chmura. The Optician (British). Vol. LXXIV, No. 1904, p. 74. 1927.

Chmura describes the effects, which he recommends, of reflecting glasses, made by incorporating very thin layers of silver, platinum or gold over glass. Lenses of this type absorb the infra-red ray.

T. O. B.

LATENT HYPEROPIA. J. H. Sutcliffe. The Optician (British). Vol. LXXIV, No. 1904, p. 74. 1927.

Sutcliffe believes that all the latent hyperopia can be overcome by the use of the following procedure: After the patient has been thoroughly refracted by both skiametry and subjective tests his distance correction is placed before his eyes and he is then directed to read some small type placed at 12 inches. Plus spheres are then added until no further improvement in near vision takes place. The difference between the distance correction and the added plus being, he believes, the total of the latent hyperopia. The test is made monocularly.

T. O. B.

TREATMENT OF PROGRESSIVE MYOPIA. M. Wiener. Journal of the American Medical Association. Aug. 20th, 1927, p. 594.

To arrest the progress of progressive myopia Wiener suggests increasing the epinephrine output of the suprarenal glands (kidneys); proper diet and plenty of outdoor exercise. He does not believe in restricting near point work providing it does not interfere with the outdoor exercise.

T. O. B.

ANNOTATIONS AND SOCIETY PROCEEDINGS

The American Journal of Optometry is the official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Iowa, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania and Vermont Optometric Associations.

The following gentlemen have consented to supply items of interest from their respective sections, acting in the capacity of

ASSOCIATE STATE EDITORS

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DR. C. A. PERRIGO
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ADVERTISING ON THE PART OF PROFESSIONAL MEN

"In this age of great activity in the advertising world, and because of the natural desire on the part of advertising agencies and publishers to extend advertising to every calling in life, the question is sometimes raised as to why professional men do not advertise. It could not reasonably be expected that men engaged in the advertising business, and to whom the principle of advertising has become an established article of faith, should be able to recognize readily the distinction between advertising a business and advertising a profession; and yet that there is a distinction and a very vital one, no one of any discernment who looks into the matter with unbiased eyes can fail to realize. One of the chief arguments against it is, that advertising on the part of professional men implies that the advertiser is superior to his fellows and has greater ability—which claim is usually unfounded, and is therefore misleading and demoralizing. No real professional man will vaunt his own personality by advertising—the idea is different from advertising commodities.

"It would seem desirable at this time, in view of the activity in the advertising world, that a reason be given why professional men do not advertise.

"It is not because they wish to assume a holier-than-thou attitude toward their fellowmen, nor because they are opposed to advertising on general principles. They recognize the right of a merchant to advertise his goods, or of a brewery to advertise its beer (when it is within the law), but they honestly believe that there is a difference

between advertising commodities and advertising professional service. There is no impropriety in a man's praising his goods, but there is impropriety when he begins to praise himself and that is precisely what the professional man does when he advertises. To herald to the world one's individual excellence is perilously close to vulgarity, and every time a professional man published an advertisement about himself, he is doing this very thing.

"Moreover, most advertising on the part of professional men is untrue and misleading, and misleading advertisements of any kind are demoralizing and are beginning to be frowned on by the advertising world—which is a very healthy sign of the times. If a professional man advertises it is prima facie evidence that he cannot gain a practice without it, and this in itself should be considered a reflection on his ability or his aptitude for his calling. A practice which is not gained by recommendation of one patient to another is never founded on a substantial basis, and this is why professional men sometimes find the first period of their practice rather slow. To advertise publicly in a situation like this is never to solve the problem. The intelligent public has developed a suspicion of professional men who advertise, and well it might.

"In this connection, we should like to ask this question: If the reader had a little boy or girl who was the very apple of his eye, and for whose welfare he would willingly sacrifice his very life, and this little boy or girl should chance to need a tonsil or adenoid operation, would he take the child to a metropolitan man who advertised that he would perform the operation for $25.00, if he knew nothing of the man except what he saw in the advertisement? And if he would not do it himself, would he expect other intelligent parents to do so?

"The whole idea of professional advertising is becoming more and more repellent to thinking people. It is not only a tradition but also a principle that is involved, a principle of the highest ethical import, and the more we develop our ideals, the farther we shall get away from this unfortunate practice.

"What would be thought of one of the leading lights of law or medicine, or of the minister if he inserted an advertisement in the public press lauding his own qualifications to practice his profession? And what would be thought of a prominent dentist, representing even a profession of less than a century of independent existence, if he should issue a public statement that he was better than other men in his calling?

"Where would dentistry have been today in the eyes of the world if its representative men *had* advertised? It would never have been a profession at all—it would have dragged its weary way along as the tail end of some trade, and it never would have been known as a recognized part of the great health service that is being heralded today as one of the chief factors in promoting the future efficiency and happiness of the people."

The foregoing paragraphs were taken from an editorial which

appeared in the JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, and apply so nicely to the optometric problem that we reproduce them in full. The moral is obvious, and as we have pointed out before, we believe optometric advertising to be one of the chief factors which are retarding the professional development of the science.

Professional men do not advertise, and the time is now here for our societies to assume a strong and unwavering position on this matter.

C. C. K.

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A. O. A. GRADUATE COURSE AT THE OHIO STATE UNIVERSITY

Dr. H. Riley Spitler and his confreres in the Department of Education of the A. O. A., have arranged a splendid week of Graduate Work at the Ohio State University, starting April 16th. The course will embrace a review of the Anatomy of the Eye and Accessory Sinuses; Histology; Embryology; Physiology; General Pathology; Ocular Pathology, with clinical cases for slit-lamp work and ophthalmoscopic work; Ocular examination of Children; Color Vision and Illumination; Visual and Color Fields and their optometric significance and Fusion Reserves and Training. The registration fee for members of the A. O. A. is $10, which will permit the registrant to attend as many lectures and clinics as desired.

This is the type of work which the A. O. A. should be doing and optometrists throughout America are awaiting the time when our National Association will sponsor ten or twelve of these Graduate Weeks in different sections of the country each year at some large educational seat. Spitler is performing a real service to the profession in inaugurating this educational service.

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CROSS MEMORIAL FUND

More than $3,000 has been raised from some 500 optometrists by the Cross Memorial Fund Commission, headed by Dr. F. A. Woll, of the College of the City of New York. It has been announced that a former patient of Dr. Cross wishes to add $1,500 to this fund and has agreed to do so as soon as the amount raised by the commission reaches $5,000. Practitioners are urged to send their pledges to Dr. Woll in care of the college at once. This memorial fund is to be used for optometric scholarships.

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NORTH DAKOTA STATE BOARD

Governor Sorlie, of the State of North Dakota, has just announced the appointments of the following men to the State Optometric Board: Dr. G. A. Carlson of Fargo to June 1930. Dr. H. Kornmesser of Jamestown to June, 1931, and Dr. A. S. Anderson of Williston to June, 1932. The other members of the Board are Dr. R. E. Bonham of Bismarck and Dr. R. P. Merrit of Kenmare.

INTERNATIONAL BOARD OF EXAMINERS IN OPTOMETRY

Dr. Chester H. Johnson, President of the International Board of Examiners in Optometry, announces that the annual meeting of this group of examiners will be held at Grand Rapids, Michigan, during the Convention of the A. O. A. in that city. The dates being July 22nd to 24th.

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THE NEW YORK ACADEMY OF OPTOMETRY

The regular March meeting of the New York Academy of Optometry was held in the office of Dr. Franklin D. Seward, Friday evening, March 9th. Among the business transacted was the appointment of Dr. C. Treleaven of Columbia University as chairman of a committee on the subjects to be debated upon at the May meeting, namely, the relative value of the kratometer, the myoculator and the phorometer, in optometric diagnostic and treatment work. The New York Academy of Optometry also unanimously voted a subscription to the Cross Memorial Fund.

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ASSOCIATION OF WHOLESALE OPTICIANS

The Association of Wholesale Opticians has through its secretary made an appeal to optometric societies to refrain from coercing its members into placing advertisements in optometric convention bulletins, the association feeling that this form of advertising is of little or no value. In this we wholeheartedly agree, feeling also that as professional men, optometrists should finance their own gatherings, thus remaining entirely independent from the commercial influences of the material supply houses. In fact the time is fast approaching when the technical gatherings of optometrists will meet behind closed doors.

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OKLAHOMA ANNUAL CONVENTION

Dr. E. B. Alexander, secretary of the Oklahoma Association of Optometrists, announces that the Annual Convention of their society will be held at the Huckins Hotel, Oklahoma City, Oklahoma, April 16th and 17th.

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INFERIOR OPTICAL MATERIAL

In the December, 1927, issue of the AMERICAN JOURNAL OF OPTOMETRY, the suggestion was made that all ophthalmic lenses come up to a certain high standard or else be destroyed by the manufacturers themselves. This editorial was written and printed before the following facts came to hand. It seems that the officers of the Central Chamber of Weights and Measures of the Soviet Government of Russia have decided to take a hand in seeing to it that the citizens of that country are not made to bear the burden of their country being made the dumping ground for second.

third, and even poorer quality lenses shipped in from other parts of the world.

The Presidium of the Supreme Council of Public Economy of the U. S. S. R. decreed the compulsory testing of trial-cases, the compulsory testing of instruments used for measuring optical properties of ophthalmic lenses and the testing of spectacles, eye-glasses and spectacle lenses. These testings are to be carried out according to:

(1) "Regulation for testing and stamping trial cases."

(2) "Regulations for testing and stamping instruments for measuring optical properties of ophthalmic lenses."

(3) "Regulations for testing spectacles, eye-glasses and single lenses."

These regulations were suggested by the Central Chamber of Weights and Measures, which for this purpose organized a special committee, including the representatives of the Central Chamber of Weights and Measures, the Russian Optical Society, the Leningrad Ophthalmological Society and the Leningrad Optical Institute.

Now we have not as yet had time to read these regulations in full, nor are we inferring that we at all agree with the Russian Government or for that matter any Government stepping in and doing this bit of needed work. The point we wish at this time to make being that it is a grave mistake to let matters "roll along" as they are until public officials have to take it upon themselves as a matter of public safety to do a piece of work which should have been done years ago by the various elements of the professions involved themselves. Let us re-state our position on this matter. We believe all second, and poorer quality lenses should be destroyed by the makers of lenses themselves. A high tariff wall erected by Congress to protect the American lens maker, and that the cost of destroying the second quality lenses be passed on to the practitioner.

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INTERSTATE ACADEMY OF OPTOMETRY

Optometrists of Northwestern New York and Northeastern Pennsylvania have met and formed the Inter-State Academy of Optometry. Membership in this local Academy is limited to optometrists practicing exclusively and ethically. Meetings of educational character will be held in various cities in the district. Drs. Harvey, Cook, Powers, Baer, Bushnell and Morris comprise the organization committee.

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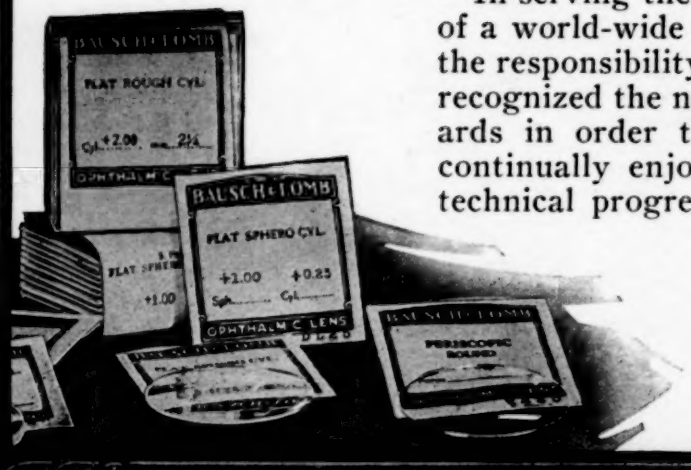
SOUTH DAKOTA ASSOCIATION OF OPTOMETRISTS

Dr. R. G. Colberg, president of the South Dakota Association of Optometrists, reports that the Mid-Winter Educational meeting of the society was one of the most valuable ever held in the State. Dr. E. G. Wiseman of Buffalo, N. Y., was the speaker, presenting some of the newer theories on nerve innervation. The meeting was held in Aberdeen on the 29th of February.

A TRUE OPTICAL CE

Rochester is the Optical Center of America Bausch & Lomb is the Optical Center of Rochester



BACK in '53, when John J. Bausch founded the business that bears his name, he little realized that he was planting the seed of an institution destined to become the optical center of the Western Hemisphere.

Success breeds success. And today the optical center of the optical city is Bausch & Lomb, the optical headquarters of America.

In serving the optical and ophthalmic needs of a world-wide clientile, we have always felt the responsibility of leadership. We have ever recognized the necessity for the highest standards in order that the eyes of man might continually enjoy the fruits of scientific and technical progress.

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